IN THE CLAIMS:

Claims 1-60. (Cancelled)

61. (Previously Presented) A gas separation system for separating a feed gas mixture comprising a first gas component and a second gas component, the gas separation system comprising:

a stator, including a first stator valve surface, a second stator valve surface, and a plurality of function compartments opening into the stator valve surfaces;

a rotor rotatably coupled to the stator, and including a first rotor valve surface, a second rotor valve surface in communication with the second stator valve surface, and a plurality of rotor flow paths for receiving adsorbent material therein for preferentially adsorbing the first gas component in response to increasing pressure in the rotor flow paths in comparison to the second gas component, each said rotor flow path including a pair of opposite ends opening into the rotor valve surfaces for communication with the function compartments; and

a split stream centrifugal compressor having a casing and coupled to a portion of the function compartments, and including a gas inlet for receiving the feed gas mixture, an impeller disposed within the casing and configured for imparting kinetic energy to the feed gas mixture to form an ejected gas flow, a volute defined between the casing and the impeller for receiving the ejected gas flow, and at least two diffusers in communication with the volute for receiving the gas flow from the volute and extending tangentially from the pump casing, wherein one of the at least two diffusers is configured to discharge a boundary layer flow from the gas flow delivered by the volute.

62. (Previously Presented) The gas separation system as claimed in claim 61, wherein the one of the at least two diffusers extends from an outer wall of the casing.

63. (Previously Presented) The gas separation system as claimed in claim 62, wherein the one of the at least two diffusers merges with the outer wall of the casing.

64. (Previously Presented) The gas separation system as claimed in claim 63, wherein the volute is configured to define a flow path for the ejected gas flow received from the impeller, and wherein each of the at least two diffusers includes an inlet communicating with the volute, and wherein the inlet of the one of the at least two diffusers extending from and merging with the outer wall is disposed earlier in the flowpath than the inlets of the other of the at least two diffusers.

65. (Previously Presented) The gas separation system as claimed in claim 64, wherein each of the at least two diffusers is fluidly coupled to a respective one of the plurality of function compartments.

66. (Previously Presented) The gas separation system as claimed in claim 65, wherein the one of the at least two diffusers, which is configured to discharge a boundary layer flow from the gas flow delivered by the volute, is configured to deliver the boundary layer flow to a one of the plurality of function compartments at a delivered boundary flow fluid pressure, and at least one of the other ones of the at least two diffusers is configured to discharge a non-boundary flow portion of the gas flow and deliver the non-boundary flow portion of the gas flow to a corresponding other one of the plurality of function compartments at a delivered non-boundary flow fluid pressure greater than the delivered boundary flow fluid pressure.

67. (Previously Presented) The gas separation system as claimed in claim 65, wherein the one of the at least two diffusers, which is configured to discharge a boundary layer flow from the gas flow delivered by the volute, is configured to deliver the boundary layer flow to a one of the plurality of function compartments at a delivered boundary flow fluid pressure, and each one of the other ones of the at least two diffusers is configured to discharge a non-boundary flow portion of the gas flow and deliver the non-boundary flow portion of the gas flow to a corresponding other one of the plurality of function compartments at a delivered non-boundary flow fluid pressure greater than the delivered boundary flow fluid pressure.

68. (Previously Presented) A gas separation system for separating a feed gas mixture comprising a first gas component and a second gas component, the gas separation system comprising:

a stator, including a first stator valve surface, a second stator valve surface, and a plurality of function compartments opening into the stator valve surfaces;

a rotor rotatably coupled to the stator, and including a first rotor valve surface in communication with the first stator valve surface, a second rotor valve surface in communication with the second stator valve surface, and a plurality of rotor flow paths for receiving adsorbent material therein for preferentially adsorbing the first gas component over the second gas component in response to increasing pressure in the rotor flow paths, each of the rotor flow paths including a pair of opposite ends opening into the rotor valve surfaces for communication with the function compartments; and

centrifugal turbomachinery simultaneously communicating with more than one of the plurality of function compartments and configured for exposing each of the more than one of the plurality of function compartments to different pressures, and sequentially exposing each of the rotor flow paths to different pressures as the rotor rotates.

69. (New) The gas separation system as claimed in claim 68, wherein the centrifugal turbomachinery comprises an impeller and a plurality of impeller flow paths, each of the impeller flow paths simultaneously communicating with more than one of the plurality of function compartments and configured for exposing each of the more than one of the plurality of function compartments to different pressures and sequentially exposing each of the rotor flow paths to different pressures as the rotor rotates.

70. (New) The gas separation system as claimed in claim 69, wherein the impeller is configured to create different pressures in each of the impeller flow paths.